

7.—*Habeobdella stagni*, a new genus and species from South-Western Australia (Hirudinoidea: Richardsonianidae)¹

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Abstract

Leeches from Herdsmans Lake, Lake Monger, Serpentine (and possibly Greenbushes) are a new species assigned to a new genus distinct in having xxv 5/5- or 4/5-annulate, and xxvi incomplete 3-annulate. A possible second genus is indicated in leeches from near Bullsbrook and from the Donnelly River.

Introduction

This paper gives the first account of the general morphology of an aquatic, jawed, sanguivorous leech from Western Australia, a leech with somite xxv essentially 5-annulate, as shown by Johansson (1911) who had five specimens from Western Australia, and briefly described the colour, pattern, and the annulation of the posterior somites of the body. Johansson assigned these leeches to *Hirudo australis* Bosisto 1859, a species recognized at that time and until recently as the only 5-banded aquatic jawed sanguivore in the Australian Region. *H. australis* (Richardson, 1968) had been transferred to the genus *Limnibdella* Blanchard 1893. Johansson did not consider *Limnibdella* separable from the genus *Hirudo*. He followed Moquin-Tandon and Blanchard in accepting a very wide range of variation in pattern and colour in the hirudiniform species, and the '*Hirudo australis*' in his 1911 paper can now be seen as including leeches belonging to three distinct genera (Richardson, 1971¹).

It has been accepted since Whitman (1886) that the complete 5-annulate somite occurs in hirudiniform leeches only on the nephric somites, viii to xxiv; rarely on all; commonly on ix to xxiv with xxv 4-annulate or on ix to xxiii with xxiv 4-annulate and xxv 3-annulate, and with xxvi 2-annulate in both these groups.

In terms of this 'rule', the novelty shown by Johansson has been open to doubt as a possible artefact, the more so since he showed xxvi as incomplete 3-annulate, and did not consider the novelty as a sufficient basis for separation of the leeches from Western Australia from *australis* known until then only in eastern Australia.

There are other divergences from the 'rule' (Richardson, 1969; 1971¹). These can be recognized now as indications for distinct systematic status.

The annulation described by Johansson is confirmed in specimens among 23 aquatic jawed sanguivores in collections from 11 localities in Western Australia, housed in the Western Australian Museum. The collections are limited. The specimens vary in condition. From among them, it is possible to provide a necessary new genus based on a type from a convenient locality. It is hoped that studies will be undertaken on ample material to demonstrate the nature of the variation in annulation.

Habeobdella Richardson, gen. nov.

Derivation of generic name: *habere*, to be in possession of; *bdella*, a leech. Gender: feminine.

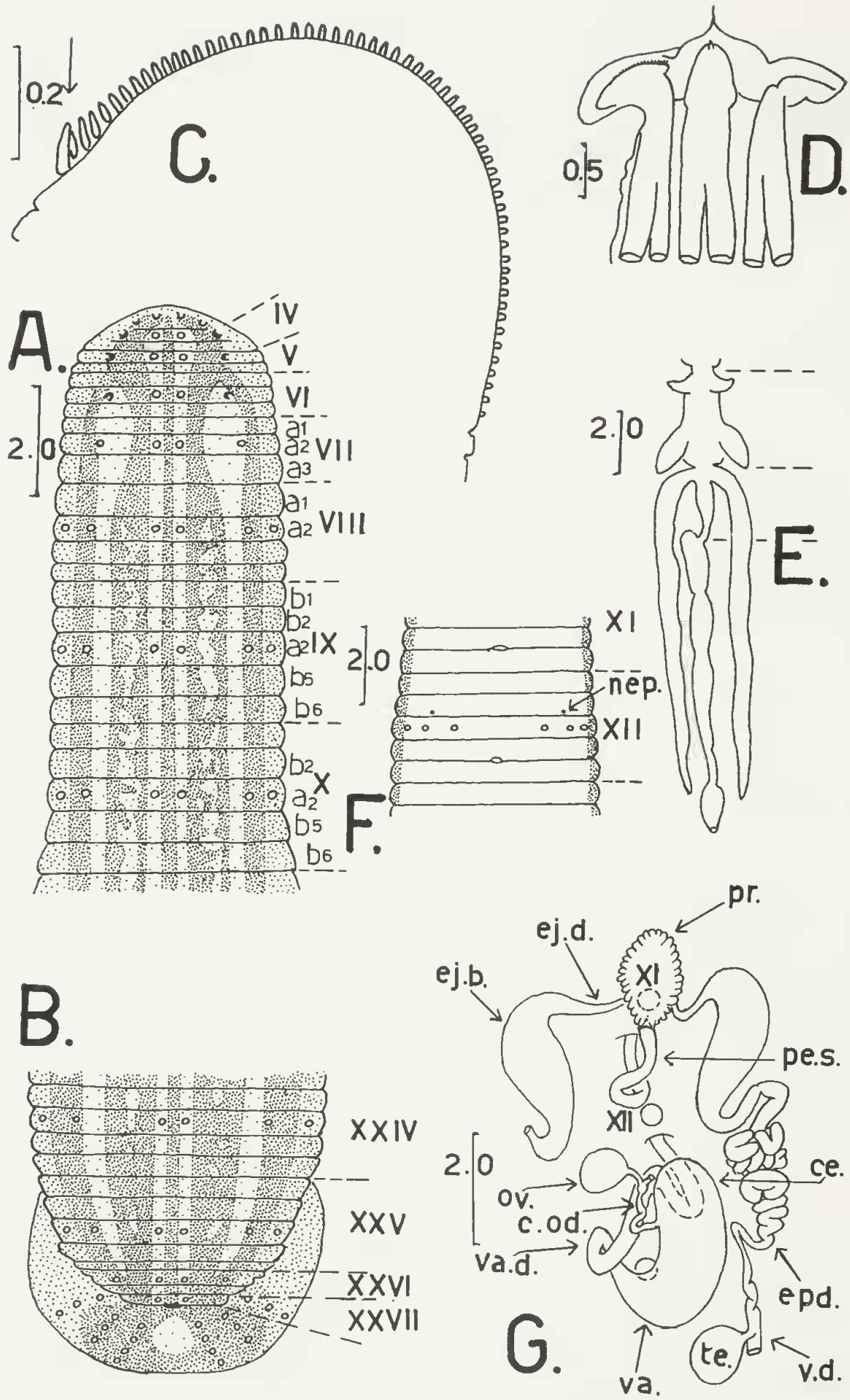
Monostichodont; ix to xxiv complete 5-annulate (total 16); xxv more or less 5-annulate above and below; xxvi incomplete 3-annulate; somital sense organs small, circular, obscure; jaws small; teeth small, about 58 to 60; no salivary gland papillae; dorsal salivary glands, compact masses with right and left columns of aggregated ducts; radial muscles an obvious extrinsic system; mouth and lumen of pharynx narrow, the lumen tubular, tapering; pharynx with 6 internal muscular ridges joining as dorsomedian and ventrolateral pairs to enter the corresponding jaws, none ending independently between the bases of the jaws; pharynx terminating in ix; crop with a short compartment in ix, x to xviii, the compartments each with anterior small and posterior larger pairs of caeca, the anterior in xix forming the postcaeca extending to xxvi; genital pores xi and xii b₅/b₆; testes normally 10 pairs; epididymis in the posterior half of xii and in xiii, posterior to the simple fusiform ejaculatory bulb in the contiguous halves of xi and xii; median regions bimyomeric, mesomorphic; penis sheath cylindrical, reflected in xii; oviducts, short; common oviduct, longer; vagina fusiform, on recurrent limb of primary loop; vaginal caecum enlarged, of the width of the vagina and as long as wide; vaginal duct longer than the vagina.

Size, medium. Pattern, a medium dorsal and two pairs of uninterrupted median longitudinal dark bands. Aquatic. Sanguivorous South Western Australia.

Type species: *Habeobdella stagni* sp. nov.

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Habeobdella stagni Richardson, sp. nov.
(Figure 1.)

Type specimen: Western Australian Museum, Coll. No. 49-69, taken in mud, south end of Herdsmans Lake, Perth, W.A., 5 Nov. 1965. Length 43.0 mm, dissected, xx/xxi to xxvi opened along left side, dorsomedian and right ventrolateral jaws mounted separately. The type has xxv complete 5-annulate.

With this, one paratype, 42.0 mm long, xxv with ($b_5 + b_6$) on dorsum, the furrow b_5/b_6 marginal and complete across the venter; dissected.

The description is taken from the type.

General form

Slightly contracted, preserved, a leech of medium size; elongate, depressed, the dorsum low convex, the venter nearly flat, the margins broadly rounded, the posterior sucker large. The velum thick with rounded margins; behind this, the margins subparallel, diverging very gradually from iv/v to x b_5/b_6 , slightly wider as the clitellum to xiii a_2 , then almost subparallel diverging only slightly to the maximum width at about xx to xxii; converging behind this in the postnephric region to form the base, which is about half the width of the sucker, and the sucker slightly wider than the maximum width of the body.

The total length 43.0 mm; 2.0 mm wide at iii/iv; 3.0 mm wide at v/vi; the width 4.5 mm and the depth 2.0 mm at the male pore, 9.0 mm from the tip of the velum; maximum width 5.0 mm and depth 3.5 mm at 30 mm from the tip of the velum; the basis of the posterior sucker 3.0 mm and the sucker 6.0 mm in diameter.

Colour

Preserved: generally darkish grey; the dorsum with five black longitudinal bands, a narrow medial and wider inner and outer paired bands, the inner pair subdued along most of their length by much pale greyish clouding to such a degree and in such a manner as to appear as two narrow separate longitudinal bands; the dark bands separated by narrow pale yellow stripes; lateral to the outer paired bands, pale, faintly yellowish to brownish grey wide marginal bands sharply marked off in the submarginal field from the light grey immaculate venter. The sucker with a large wide black patch containing a central pale yellow patch, otherwise, laterally and anteriorly, the sucker pale, of the colour of the venter.

The colour in life possibly brownish black, divided by bright yellow, even golden, stripes; venter, ashen grey.

Pattern Figure 1 A,G,F.

The first four pairs of eyes marginal on a wide ocular patch in ii to vi a_1 , divided by the narrow inner pair of light stripes which define the median band from ii/iii, just behind the 1st pair of eyes, to the posterior border of xxvii. The median band generally about two thirds of the width of the median field and narrower than the inner pair of light stripes on either side of it which extend along the paramedian lines and include sense organs of this series. The inner pair of dark bands is defined between the inner and outer paired stripes between vi a_1/a_2 and xxv/xxvi, posteriorly joining a dark patch extending across the paramedian and intermediate fields of xxvi and xxvii, divided by the inner paired stripes and median band. The inner paired bands are wide, occupy about the medial two thirds of the paramedian field, widening as this field widens along the body, narrowing in and posterior to xxiv; clouded liberally from the middle of viii to xxiii with paler grey to brownish grey, appearing then more as black margins to a pale stripe as wide or wider than the combined widths of the margins; but the whole constitutes one dark band.

The outer paired light stripes are lateral in the paramedian field from vi a_1/a_2 to xxvi $a_1/a_2/a_3$ wider than the inner paired stripes, and generally uniform in width along the greater part of the body.

The outer paired dark bands separate from the ocular band at vi a_1/a_2 and extend to xxvi $a_1/a_2/a_3$, pass immediately lateral to the 5th pair of eyes and the intermediate organs of vii, but behind this, the sense organs of the intermediate series lie on or just within the inner margin of these bands which also occupy the greater part of the intermediate field, being narrowly separated from the supramarginal line of sense organs which lie in the marginal band extending across the supramarginal and submarginal fields as pale bands continuous from the velum to xxvii and onto the sucker, and are sharply distinct from the paler venter. The outer pair of dark bands show minor clouding behind viii a_2 .

The right and left dark patches on xxvii are continuous with the dark patch on the sucker which occupies the inner half or just less of the intermediate fields, the paramedian and median fields except for the central light ovoid

Figure 1.—*Habeobdella stagni* Richardson, gen. et sp. nov. A, B.—Somital annulation and pattern, dorsal aspect—A, somites i to x; B, somites xxiv to xxvii and sucker. C.—Dorsomedian jaw and dental ridge (arrow indicates medial end of ridge). D.—Anterior half of pharynx opened along the midventral line to show internal muscular ridges; jaws. E.—Crop and caecation, somites xviii and xix; intestine; rectum. F.—Ventral aspect, somites xi and xii, showing genital pores, nephropores, etc. G.—Anterior region of male paired ducts, male median region, and female reproductive system (median aspect of the organs on the male paired ducts shown; the dorsal aspects lateral in the figure.)

All figures prepared from the type. Somites and somital ganglia indicated by Roman numerals. Scales in millimetres.

Abbreviations: ce., caecum; c.od., common oviduct; ej.b., ejaculatory bulb; ej.d., ejaculatory duct; cpd., epididymis; nep., nephropore; ov., ovary; p.s., penis sheath; pr., prostate; te., testis; va., vagina; va.d., vaginal duct; v.d., vas deferens.

patch which is separated more narrowly from the posterior edge of xxvii than from the posterior edge of the sucker.

Annulation Figure 1A, B.

Somital sense organs are small, rounded, detectable often with difficulty on the dorsum excepting the intermediates, not always as continuous series, and much smaller and quite obscure on the venter. Secondary sensillae are most difficult to detect. The nephropores are obvious in the postclitellar region where most are raised on low papillae; elsewhere concealed. Interannular and intersomital furrows essentially equivalent, the annuli not arranged in obvious couplets or triplets, and somital limits without definition along most of the body. Generally the annuli are richly divided into longitudinal rectangles by fine lines which are lacking on well-extended somites, and seem to have no morphological value.

The velum consists of i, ii and iii, carries the 1st and 2nd pairs of eyes, shows no defined furrows and the margin is entire, without incisions. Somite iv is marked off anteriorly by iii/iv which extends across the median and intermediate fields; a longer furrow dividing iv into $a_1 a_2 / a_3$, with $a_1 a_2$, including the 3rd pair of eyes and first detectable paramedian sense organs $> a_3$; the furrow iv/v not quite reaching the margin of the sucker so that the dorsolateral lobe of the margin of the sucker is poorly defined; v 2-annulate above, the 4th pair of eyes in $a_1 a_2 - a_3$, the furrow $a_1 a_2 / a_3$ extending into the submarginal field so that $a_1 a_2$ forms the lateral portion of the margin of the sucker and uniannulate v, the ventral portion; vi 3-annulate above, $a_1 < a_2 < a_3$, the 5th pair of eyes in a_2 , the furrow a_1 / a_2 extending to the ventral intermediate line, and then vi 2-annulate below with $a_1 a_2 > a_3$ in the paramedian and median fields; vii 3-annulate above and below, $a_1 < a_2 < a_3$ (- viii a_1) - - - (a_3 with a very fine furrow extending between the supramarginal sense organs dividing a_3 apparently into $b_5 < b_6$ which would suggest it may not be morphological); viii 4-annulate, $a_1 > a_2 > b_5 > b_6$ the first nephropores close to the posterior border and just medial to the ventral intermediate lines on a_1 ; ix to xxiv complete 5-annulate (total 16); from ix to xxiii the somites variously contracted and the relative lengths of the annuli cannot be determined with full confidence; in general it would seem that the somital annulation for ix to xviii is $b_1 = b_2 < a_2 = b_5 > b_6$; for xix to xxi, $b_1 = b_2 < a_2 < b_5 > b_6$; for xxii to xxiv, $b_1 = b_2 > a_2 > b_5 = b_6$; the last nephropore on xxiv b_2 ; xxv complete 5-annulate, $b_1 < b_2 = a_2 > b_5 > b_6$, the furrow b_5 / b_6 strongly defined and deep on both the dorsum and venter, with a_2 , b_5 and b_6 reduced in length on the venter where $b_1 = b_2 > a_2 = b_5 > b_6$; xxvi 2-annulate above, $a_1 a_2 > a_3$, the somital sense organs posterior in $a_1 a_2$, and at the margin a shallow wide groove in $a_1 a_2$ which deepens into a definite furrow across the venter where although $a_1 a_2$ is reduced in length it is weakly but definitely

divided into a_1 and a_2 , and a_2 is the last annulus complete across the venter, a_3 extending onto the dorsum of the sucker as also xxvii which is uniannulate above. The anus at the posterior border of xxvii. The dorsum of the sucker shows 4 paramedian sense organs in each line, and three in each of the intermediate and supramarginal series; some 7 or 8 concentric rows of tessellations show on the posterior half of the dorsum.

Alimentary tract Figure 1C, D, E.

The jaws are small, tall, compressed, the dorsomedian in profile at the median end, about 0.5 mm high and slightly narrower at the base; the dorsomedian housed in an open groove, the ventrolaterals in pits with such poorly defined margins as to be nonmorphological; the dental margin long, so highly convex as to be almost semicircular; the teeth about 60 on the dorsomedian, the largest about 0.05 mm high, the row reducing gradually and the teeth in the middle of the row about half as tall as those at the median end, the row progressively reducing to the last few teeth which are low, rounded, almost granular; about 56 teeth on the ventrolateral.

The pharynx is relatively thin-walled with 3 pairs of internal muscular ridges, each pair joining to enter the base of a jaw, none ending independently between the bases of the jaws; mouth narrow, little wider than the base of the dorsomedian jaw; lumen of the pharynx narrow, tubular, tapering; radial muscles sparse, but an obvious extrinsic system extending back into x; dorsal salivary glands compact right and left masses extending back into x, each drained by a poorly defined column of aggregated ducts, the columns continuing independently into the dorsomedian jaw.

The pharynx terminates in ix a_2 , followed by a short caecate compartment in ix; the crop in x to xviii fully compartmented, each compartment with a pair of simple anterior and a pair of simple posterior caeca, the two pairs nearly equivalent in x and xi; then the posterior pair progressively longer, and from xv back extending in the paramedian chamber posteriorly into the following somite where they are lateral to the anterior caeca, but all as seen were simple and not folded; the post-caeca originate from the lateral aspect of the anterior end of the compartment in xix, behind this the compartment tubular, with the lining epithelium in longitudinal rugae as elsewhere in the crop, tapering briefly to enter the intestine subterminally in the anterior annuli of xx; the postcaeca extend to xxv/xxvi.

The intestinal epithelium is raised in transverse rugae. The intestine commences with a caecate tubular segment in xx, another simple segment in xxi, followed by a tapering tubular length entering terminally into the rectum which tapers to the anus.

Reproductive system Figure 1G.

The relationship of structures on the anterior portion of the male paired ducts is richardsonianoid; the median regions bimyo-meric, mesomorphic; the vagina caecate formed

essentially on the recurrent limb with a vaginal duct on the procurrent limb. The specimen is adult, but does not appear to be in a condition of sexual maturity.

The genital pores at xi b_5/b_6 and xii b_5/b_6 ; the penis-sheath elongate, cylindroid.

The first testes are at xiii/xiv; the last in the posterior portion of xxii; behind xix, the testes are in the paramedian longitudinal chamber of the body-cavity; anterior to this, in the median chamber, all connecting by short vasa efferentia to the vas deferens in the paramedian chamber which reduces in diameter in the posterior annuli of xii before expanding into the initial narrowly tubular portion of the epididymis which is thin-walled, tortuous and much folded on itself and becomes more widely tubular before joining the ejaculatory bulb; the whole epididymis in the contiguous annuli of xii and xiii and not readily separable into two masses. The bulb is muscular, tapering elongate fusiform, connected by a short ejaculatory duct to the male atrium situated above g.xi. The atrium continues in the strongly muscular penis sheath, slightly folded on itself, and reflected at the level of g. xii as two nearly equal limbs.

The simple saccular ovaries are posterior in xii, connect by short oviducts, neither longer than the ovary, to a distinct atrium from which the thin-walled common oviduct of large lumen extends tortuously without close relationship to the vaginal duct, to join the ventral face of the vagina more remote than usual from the caecate end, about two fifths along the body of the vagina so that the caecum is quite long, the length of the width of the vagina, and the caecum unusually large; the common oviduct opens into the vagina on the tip of a low papilla at the level of the point of attachment; an epithelium with longitudinal rugae continues from the vagina into the caecum.

The caecum and vagina are in the posterior annuli of xii and in somite xiii. The muscularized body of the vagina is stoutly tubular, completes the recurrent limb of the primary loop and tapers abruptly on the initial portion of the procurrent limb into the strongly muscular vaginal duct which has a reduced lumen, is distinctly longer than the body of the vagina, and is folded closely on itself on both sides of the ventral nerve cord.

The prostate glands form an elongate tapering subovoid cap on the atrium and extending briefly along the penis sheath. The albumin glands invest the atrium and the length of the common oviduct.

Paratype

Similar in colour and anteriorly in pattern to the type; posteriorly as in the type excepting that the narrow paramedian light stripes extend onto the dorsum of the sucker, but only so much as to closely encircle the anus, and there is a small light patch central on the posterior margin of the sucker. The paramedian bands along the body fill half or slightly more of the paramedian fields, each with a wide dark inner margin about half the width of the whole band, and the rest clouded so that there is no dark outer margin.

Annulation differs from the type: iv a_1a_2/a_3 , the first furrow extends only to the intermediate line, as also iv/v; the clitellar annuli, xb_5 to $xiiia_2$, each with a distinct deep furrow between the submarginals so that these annuli are all strongly subdivided on the ventral surface; xxv 4-annulate above, with $b_1 = b_2 < a_2 < a_3$, but the furrow b_5/b_6 commences in the marginal fields and continues across the venter where b_5 and b_6 are distinctly represented and $b_1 = b_2 > a_2 - b_5 > b_6$; xxvi as in the type, a_1a_2 on the dorsum but divided on the venter into a_1 and a_2 , with a_2 the last annulus complete on the venter; xxvi a_3 and xxvii continue onto the dorsum of the sucker.

Alimentary tract as in the type.

Clitellar glands well developed. Ejaculatory bulbs shorter, more stoutly fusiform; penis sheath with the recurrent and procurrent limbs of the same length; oviducts, both very short; vaginal caecum at least as long as wide, of the width of the vagina and about a quarter of its length.

Other material

Leeches identifiable as *H. stagni* were present in the following collections:

1. W.A.M. 9034. *Hirudo australis* Bosisto. Serpentine, W.A.B., K.A.B., & I.J.D. No other data.

Four specimens, 23.0 to 33.5 mm long; faded; pattern as in type; xxv $b_1 < b_2 < a_2 = b_5 > b_6$ above and below, with b_6 the last annulus across the venter; xxvi a_1a_2/a_3 above, a_1/a_2 in the submarginal field; vaginal caecum as in type.

2. W.A.M. 52-69. Lake Monger, Oct. 1952.

Five specimens, 14.0 to 33.0 mm. Stripes, yellow; pattern and annulation as in type; pattern fully established in the 14.0 mm specimen; vaginal caecum as in type. One specimen retained, deposited the Australian Museum, Coll. No. W 4269.

3. W.A.M. 50-69. Greenbushes swimming pool (in abundance), coll. H. Williams, 26 Dec., 1962.

Two specimens, 32.0 and 49.0 mm. Stripes yellow; pattern and annulation as in type excepting xxv incomplete 5-annulate below with a_2 the last annulus across the venter; enlarged vaginal caecum, of the width of the vagina, but not as long as wide. Note: with a full knowledge of variation in *stagni*, this might prove distinct.

Discussion

The genus *Habeobdella* conforms in morphology to the Richardsonianidae of the Australian Region.

Lacking salivary gland papillae on the jaws, with 16 complete 5-annulate somites (ix to xxiv), bimyomeric mesomorphic median regions on the reproductive systems, simple fusiform ejaculatory bulbs and vagina, a vaginal duct, and a pattern of 5 uninterrupted dark longitudinal dorsal bands, *Habeobdella* is similar

(Richardson, 1970) to the genus *Richardsonianus* Soos 1968 based on *Hirudo australis* Bosisto 1859.

Habeobdella differs from *Richardsonianus*, as also from the other 16 5-annulate genera so far known in Australia, in the essentially 5-annulate condition of xxv, the 3-annulate condition of xxvi and the very large vaginal caecum which has not been seen in other Australian leeches.

In the collections there is another leech possibly representative of a second genus; but the material is not adequate for a complete description.

A specimen from near Bullsbrook (W.A.M. 56-69), 65.0 mm long, and two specimens from the Donnelly River (W.A.M. 54-69) 16.0 and 28.0 mm long, differ from *H. stagni* in having elongate almost subcylindrical ejaculatory bulbs resembling the bulbs in bassianobdellid leeches; the vaginal caecum small, short, the vagina simple fusiform with a vaginal duct.

Both have xxv 5-annulate above, with a₂ the last annulus across the venter in the Bullsbrook specimen, and b₅ the last such annulus in the Donnelly River specimens. Somite xxvi is 2-annulate above in all three.

There are about 50 teeth on the dorsomedian jaw of the Bullsbrook specimen. These are distinctly small, the tallest at the median end being 0.03 mm high, and the row diminishes so gradually as to appear almost uniform in height along the greater part of its length.

They differ from *H. stagni* in pattern. The larger of the Donnelly River leeches lacks the outer paired light stripes lateral in the paramedian fields; the smaller has these stripes, but they are interrupted and extend only between x a₂ (right) and xi a₂ (left) to xxii/xxiii. In both, a dark marginal band commences in the lateral half of the intermediate field and extends to just include the marginal line of sense organs, where it is then sharply separated from the pale venter which has a few spaced large maculae.

In the Bullsbrook leech there are poorly defined narrow outer paired light stripes which extend along the line of the intermediate somital sense organs. There are dark marginal bands which are continuous with the immaculate venter.

The differences in the topography of pattern in the Bullsbrook and Donnelly River leeches are indicative of possible distinct species (Richardson, 1971^b); but as I cannot determine the relative lengths of the annuli in the midnephric group of somites, the matter cannot be taken further on these specimens.

Acknowledgements

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